# SUPPORTING DISK FOR A SURFACE GRINDING WHEEL AND SURFACE GRINDING WHEEL

## BACKGROUND OF THE INVENTION

### Field of the Invention

The invention relates to supporting disks for a surface grinding wheel and to a surface grinding wheel comprising a supporting disk.

### Background Art

Surface grinding wheels comprise a supporting disk and abrasive laminas mounted thereon. The abrasive laminas, which deliver stock removal upon operation, customarily comprise commercial abrasives on a cotton or polyester substrate. As a rule, the abrasive laminas are being fixed on the supporting disk by epoxide resin adhesive. The supporting disk serves for rotating the abrasive laminas and for the pressure necessary for the grinding job to be transmitted by the operator from the driving motor to the abrasive laminas and, consequently, to the subject that is to be machined. Consequently, the supporting disk is only of indirect importance for the result of the grinding job. Another important function of the supporting disk resides in ensuring the necessary safeguard against centrifugal fracture of the surface grinding wheel. Surface grinding wheels are regularly operated at a circumferential speed ranging from 50 m/s to 80 m/s. The considerable mechanical stresses that occur in the supporting disk in this case demand for the use of high-strength material.

It is known from DE 200 05 548 U1 and DE 299 14 325 U1 to make the supporting disk of metal.

DE 298 05 508 U1 further teaches to manufacture a supporting disk for a surface grinding wheel from metal and to provide the outer edge thereof with a plastic material protective arrangement.

It is known from DE 299 10 931 U1 to manufacture a supporting disk for a surface grinding wheel from synthetic resin which is at least partially reinforced by natural fibers.

It is further known to embody supporting disks as glass-fiber reinforced phenolic resin bodies. The production costs are very high in particular when a supporting disk of this type includes a plurality of textile-glass fabrics. More than five and even more than twelve layers of textile-glass fabrics are used as a safeguard against centrifugal fracture.

In particular the flexural strength of the supporting disks is of decisive importance as a safeguard of the tools against centrifugal fracture. When loaded by centrifugal forces, the supporting disk sags as a result of the weight of the abrasive laminas that bears on it, which strongly loads the adhesive mechanically, terminating in the laminas being torn off.

In order to obtain the required flexural strength of the supporting disk, a sufficiently great number of glass fabrics must be selected, which is the present level of knowledge. The necessary number of fabric layers depends on the total weight of the abrasive laminas that are mounted on the supporting disk. The number of abrasive laminas is also directly proportional to the lifetime of the tool. Therefore, tools that have a long lifetime must com-

comprise a plurality of fabric layers, for example twelve layers, so as to comply with safety requirements.

## SUMMARY OF THE INVENTION

It is an object of the invention to embody a supporting disk for a surface grinding wheel in such a way that the supporting disk can be manufactured at a low cost while keeping its highly protective properties of safeguard against centrifugal fracture and to embody a surface grinding wheel that comprises a supporting disk of this type.

This object is attained in a supporting disk for a surface grinding wheel, comprising a glass-fiber reinforced phenolic resin body, which includes an upper covering layer of a textile glass fabric or a glass-yarn layer; an intermediate layer of a fiber mat; and a lower covering layer of a textile glass fabric or a glass-yarn layer. According to the invention, a comparatively expensive textile glass fabric or glass-yarn layer is utilized only in the upper and lower covering layer, whereas a simple intermediate layer in the form of a fiber mat is used as a filler between these two covering layers. When the supporting disk is loaded during grinding operation, mechanical stresses occur in addition to the strain due to centrifugal force as a result of the supporting disk sagging in the direction of its axis. The greatest bending stresses occur upon loading of the surface areas, while the intermediate area remains almost stress-free when loaded by bending. The coverings of textile glass fabric or glass-yarn layers have a higher loading capacity than the fiber-mat intermediate layer. As opposed to the prior art number of five layers or more, the supporting disk according to the invention only comprises three layers, of which only the two exterior coverings consist of comparatively costly fabrics or layers while the intermediate layer consists

of a comparatively low-cost fiber mat as a filler. The job of the intermediate layer primarily resides in producing as great a distance as possible between the two coverings that possess by far greater tensile strength than the intermediate layer. As a rule, the intermediate layer is thicker than the covering layers.

Generally, the design of the surface grinding disk that is manufactured using a supporting disk of this type is conventional.

Further advantages, features and details of the invention will become apparent from the ensuing description of exemplary embodiments, taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a central cross-sectional view of a surface grinding wheel;

Fig. 2 is a plan view of a textile glass fabric;

Fig. 3 is a plan view of a glass-yarn layer;

Fig. 4 is an explosive view of a blank for a supporting disk with covering layers of textile glass fabric; and

Fig. 5 is an explosive view of the blank for a supporting disk with glass-yarn-layer coverings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As seen in Fig. 1, the fundamental and familiar design of a surface grinding wheel includes a supporting disk 1 and abrasive laminas 2. The supporting disk 1 has the shape of a circular ring with a central longitudinal axis 3. Concentrically of the axis 3, it is provided with an opening 4 for accommodation of the driving shaft of a driving motor. The supporting disk 1 further comprises an outer annular marginal area 5, to which the abrasive laminas 2 are customarily fixed by means of glue (not shown), overlapping each other. As further seen in Fig. 1, the supporting disk again comprises an upper covering layer 6, an intermediate layer 7 and a lower covering layer 8.

The upper covering layer 6 and the lower covering layer 8 either consist of a textile glass fabric 9 as seen in Fig. 2, or of a glass-yarn layer 10 as seen in Fig. 3. The textile glass fabric 9 as well as the glass-yarn layer 10 consist of parallel warp threads 11 and equally parallel weft threads 12 which are perpendicular to the warp threads 11. As illustrated in Fig. 2, the difference resides in that, in the case of the textile glass fabric 9, the weft threads 12 are led alternately above and below the neighboring warp threads 11 for the linen weave illustrated. Of course, it is conceivable to make use of a weave other than the linen weave. Fundamentally, the fabrics 9 include two systems of warp threads 11 and weft threads 12 that cross at right angles for a given type of weave. As opposed to this, in the case of the glass-yarn layer 10, the warp threads 11 lie on a plane and the weft threads 12 also are on a plane on top of the warp threads 11. In this case too, the warp threads 11 on the one hand and the weft threads 12 on the other are close side by side as seen in Fig. 3.

The warp threads 11 and the weft threads 12 may be glass fibers pre-processed into yarns or twines. For cost reasons, they will however be rovings serving the purpose. Fundamentally, rovings constitute a plurality of textile glass filaments that are combined nearly in parallel, having among them a given, largely identical strand fineness.

The intermediate layer 7 consists of a fiber mat, the term fiber mat also implying a fiber fleece or a fabric of a volume enlarged by needling. The needling of fabrics, known in the art, serves to multiply, for example to triplicate, the volume, i.e. the thickness, thereof, whereas the tensile strength is reduced by 50 percent, which is however of no importance – as explained at the outset. Natural fibers, for example hemp or sisal, may be used as a fiber material as well as synthetic organic fibers such as polyester or polypropylene or textile glass fibers.

Fig. 4 is an explosive view of a blank 15 for the upper covering layer 6, a blank 16 for the intermediate layer 7 and a blank 17 for the lower covering layer 8. All the blanks 15 to 17 already have the opening 4, but they are still plane. In Fig. 4, a textile glass fabric 9 is used for the upper covering layer 6 and the lower covering layer 8. Fundamentally, there are the following four possibilities of combination of the upper covering layer 6 and the lower covering layer 8:

| **upper covering layer 6** | **lower covering layer 8** |
|---|---|
| textile glass fabric 9 | textile glass fabric 9 |
| textile glass fabric 9 | glass-yarn layer 10 |
| glass-yarn layer 10 | glass-yarn layer 10 |
| glass-yarn layer 10 | textile glass fabric 9 |

Fig. 5 is an explosive view of the blank 15 and the blank 17 of glass-yarn layers 10.

Producing a supporting disk 1 takes place as follows:

The textile glass fabrics 9, glass-yarn layers 10 and the fiber mats 14 are produced and combined in such a way that a textile glass fabric 9 or a glass-yarn layer 10 as an upper covering layer 6 and as a lower covering layer 8 accommodate the intermediate layer 7 between them. The three combined layers 6 to 8 may be sewn together by threads as a safeguard during transport. This compound of layers or the individual layers are impregnated by phenolic resin, from which the blanks are subsequently punched.

This package of the upper covering layer 6, intermediate layer 7 and lower covering layer 8 is pressed and cured under the action of pressure and heat for the glass-fiber reinforced phenolic resin supporting disk 1 to form, which is then customarily worked into a surface grinding wheel.